

# 22장 광전 소자

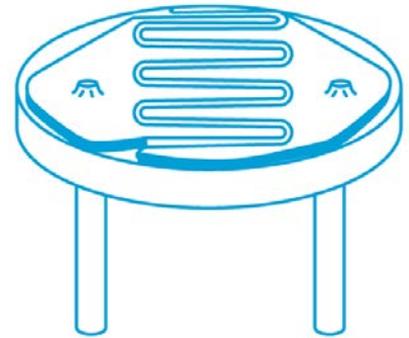


# Basic Principles of Light

- Light is electromagnetic radiation that is visible to the human eye.
- Thought to travel in a form similar to radio waves.
- Measured in wavelengths.
- Travels at 186,000 miles per second or 30,000,000,000 centimeters per second through a vacuum.
- The frequency range of light is 300 to 300,000,000 gigahertz.
  - § Visible range is from 400,000 to 750,000 gigahertz.
  - § Infrared light range is below 400,000 gigahertz
  - § Ultraviolet light range is above 750,000 gigahertz
- Light waves at the upper end have more energy than those at the lower end.

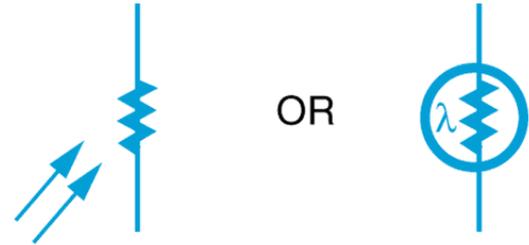
# Photoconductive Cell

- The oldest optoelectric device.
- The internal resistance changes with a change in light intensity.
- Made from light-sensitive material
  - § Cadmium sulfide (CdS).
  - § Cadmium selenide (CdSe).
- More sensitive to light than any other device. Useful for low-light applications.



# Photoconductive Cell

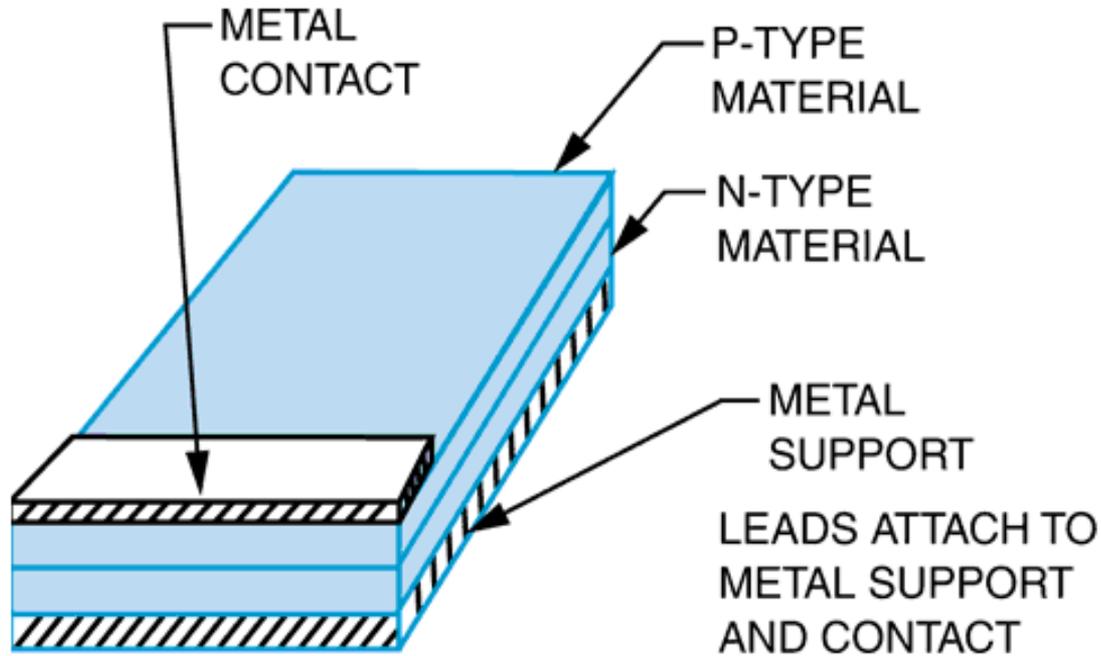
- It can stand high voltages of 200 to 300 volts with a low power consumption of 300 milliwatts.
- Slow response to light change is a disadvantage.
- Used in light meters for:
  - § Photographic equipment.
  - § Instruction detectors.
  - § Automatic door openers.
  - § Test equipment used to measure light intensity.



# Photovoltaic Cell (solar cell)

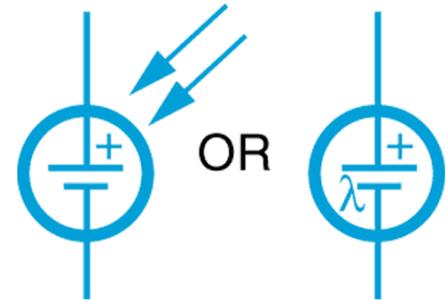
- Converts light energy directly into electrical energy.
- A PN junction made from semiconductor materials.
  - § Most commonly made from silicon.
  - § P and N layers form the PN junction.
  - § The metal support and contact act as the contacts.
  - § Designed with a large surface area.

# Photovoltaic Cell (solar cell)



# Photovoltaic Cell (solar cell)

- Highly inefficient device, with a top efficiency of 15 to 20%.
- Has a low voltage output.
- Applications include:
  - § Light meters for photographic equipment.
  - § Motion picture projector soundtrack decoders.
  - § Battery chargers for satellites.



- Uses a PN junction.
- Construction similar to the solar cell.
- Used as a light variable resistor.
- Made primarily from silicon.
- Constructed in two ways.
- Used to control current flow.
- Responds to light changes quickly.
- Low output compared to other photosensitive devices.



- Constructed with two PN junctions.
- Resembles a standard NPN transistor.
- Used and packaged like a photodiode, except:

Has three leads:

- Emitter
- Base
- Collector

# Phototransistor

- Produces higher output current than photodiodes.
- Response to light changes is not as fast as the photodiode.

